CLAIMS

What is claimed is:

1. Transient suppression apparatus coupleable in series with an electrical pathway into a potentially explosive environment for limiting current, voltage and energy thereto, said apparatus comprising:

an impedance element coupleable in series with said electrical pathway to conduct current to said potentially explosive environment, said current causing a voltage potential across said impedance element;

at least one first semiconductor element coupled to said impedance element in series with said current path upstream of said impedance element, said at least one first semiconductor element operative to impose a resistance to said current of said electrical pathway governed by the voltage potential across said impedance element; and

at least one second semiconductor element coupled to said impedance element in series with said current path downstream of said impedance element, said at least one second semiconductor element operative to impose a series resistance to said current of said electrical pathway governed by the voltage potential across said impedance element.

2. The apparatus of claim 1 wherein the impedance element comprises a resistive element.

3. The apparatus of claim 1 wherein the first semiconductor element comprises a field effect transistor which is operative to vary the resistance to said current of said electrical pathway in response to a variation of the voltage potential of a first polarity across said impedance element.

4. The apparatus of claim 3 wherein the field effect transistor is a metal oxide semiconductor field effect transistor (MOSFET) operative to withstand a high voltage potential thereacross.

5. The apparatus of claim 1 wherein the second semiconductor element comprises a field effect transistor which is operative to vary the resistance to said current of said electrical pathway in response to a variation of the voltage potential of a second polarity across said impedance element.

6. The apparatus of claim 5 wherein the field effect transistor is a metal oxide semiconductor field effect transistor (MOSFET) operative to withstand a high voltage potential thereacross.

7. The apparatus of claim 1 wherein the at least one first semiconductor element comprises a plurality of field effect transistors with current channels thereof coupled in series with the impedance element, the resistance of the current channels of the field effect transistor of said plurality being governed by the voltage potential across the impedance element.

8. The apparatus of claim 7 wherein some of the field effect transistors of the plurality including a voltage potential limiting circuit element coupled across a gate-to-channel junction thereof.

9. The apparatus of claim 7 wherein the resistance of the current channels of the field effect transistor of said plurality being varied by a variation of the voltage potential of a first polarity across the impedance element.

10. The apparatus of claim 1 wherein the at least one second semiconductor element comprises a plurality of field effect transistors with current channels thereof coupled in series with the impedance element, the resistance of the current channels of the field effect transistor of said plurality being governed by the voltage potential across the impedance element.

11. The apparatus of claim 10 wherein some of the field effect transistors of the plurality including a voltage potential limiting circuit element coupled across a gate-to-channel junction thereof.

12. The apparatus of claim 10 wherein the resistance of the current channels of the field effect transistor of said plurality being varied by a variation of the voltage potential of a second polarity across the impedance element.

13. The apparatus of claim 1 including a voltage potential surge suppression element coupled in parallel with said electrical pathway upstream of the current path of the at least one first semiconductor element.

14. The apparatus of claim 1 including a voltage potential surge suppression element coupled in parallel with said electrical pathway downstream of the current path of the at least one second semiconductor element.

15. A system for determining a quantity of fuel in a container, said system comprising:

at least one sensor disposed at said container for sensing a quantity of fuel in the container;

sensor excitation system coupled to each of said at least one sensor through an electrical pathway for providing an excitation signal thereto;

transient suppression apparatus disposed in series with each said electrical pathway for limiting current, voltage and energy to the container, said apparatus comprising:

an impedance element coupled in series with said electrical pathway to conduct current to the sensor to which it is coupled, said current causing a voltage potential across said impedance element;

at least one first semiconductor element coupled to said impedance element in series with said current path upstream of said impedance element, said at least one first semiconductor element operative to impose a resistance to said current of said electrical pathway governed by the voltage potential across said impedance element; and

at least one second semiconductor element coupled to said impedance element in series with said current path downstream of said impedance element, said al least one second semiconductor element operative to impose a series resistance to said current of said electrical pathway governed by the voltage potential across said impedance element.

16. The system of claim 15 being disposed on an aircraft; and wherein the container comprises an aircraft fuel tank and the fuel comprises aircraft fuel.

17. The system of claim 15 wherein the sensor excitation system is operative to generate an excitation signal of the group of signals comprising AC, DC and pulsed excitation signals to excite a sensor at the container; and wherein each transient suppression apparatus is adaptable to accommodate any excitation signal of said group.

18. The system of claim 15 wherein the transient suppression apparatus is operative to limit the current, voltage and energy to the container caused by threats to the system to within levels considered safe.

19. The system of claim 15 wherein the transient suppression apparatus is operative to limit the current, voltage and energy to the container caused by failures of the system to within levels considered safe.

20. The system of claim 15 wherein the transient suppression apparatus is disposed in series with each electrical pathway in close proximity to the container.